Claims

1. A metal sheet drilling disk roll formed with a plurality of drilling blades provided on an outer circumferential surface thereof in a circumferentially spaced manner and in a radially projecting state, characterized in that:

the shape in plan of each drilling blade on an outer circumferential surface of the disk roll is set to a geometric shape surrounded by one closed line,

the shape in side elevation of side surfaces of the drilling blade being set concave so that the height of both of circumferential end portions of the blade becomes larger than that of the other portion thereof with the height of the blade becoming gradually smaller from the two circumferential end portions thereof toward a central portion thereof.

2. A metal sheet drilling disk roll according to Claim 1, wherein the shape in side elevation of side surfaces of the drilling blade is set so that the height of one circumferential end portion thereof, i.e. a preceding circumferential end portion thereof with respect to the rotational direction of the disk roll becomes smaller than that of the other circumferential end portion thereof, i.e. a posterior circumferential end portion thereof with respect to the same direction.

SUBA17

3. A metal sheet drilling disk roll according to Claim 1 or 2, wherein the shape in plan of the drilling blade is set

to a rectangular shape or a substantially rectangular shape with four corner portions thereof rounded.

4. A metal sheet drilling disk roll according to Claim 1 or 2, wherein the shape in plan of the drilling blade is set to one of an elongated circular shape, an elliptic shape, a right circular shape, a rhomboidal shape and a substantially rhomboidal shape with four corner portions thereof rounded.

5. A metal sheet drilling device for making a plurality of holes in a metal sheet or metal foil, characterized by:

disposing the metal sheet drilling disk roll according to one of Claims 1 to 3 as an upper side roll, and connecting coaxially to both sides of the upper roll a pair of upper side guide rolls the radius of each of which is set smaller than the length measured from the center of the metal sheet driving disk roll to the lowest portion of the drilling blade, by at least a size corresponding to the thickness of the metal sheet or metal foil to form an upper roll unit,

disposing as a guide roll a disk roll the thickness of which is slightly larger than that of the metal sheet driving disk roll, and connecting coaxially to both sides of the guide roll a pair of lower side guide rolls the radius of each of which is set larger than that of the disk roll by a length corresponding to the sum of the thickness of the metal sheet or metal foil and a difference between an amount of projection of the highest portion of the drilling blade and that of

projection of the lowest portion thereof, to form a lower roll unit,

engaging the upper roll unit and lower roll unit with each other, and forming portions capable of being drilled in the metal sheet while passing the metal sheet or metal foil beneath the drilling roll disk, and

disposing on the front and rear sides of the portions to be drilled tensile force application units formed of means for applying a tensile force to the metal sheet or metal foil.

6. A metal sheet drilling device according to Claim 5, wherein a plurality of sets of the upper roll units and lower roll units which constitute the drilling unit are connected together coaxially, whereby a plurality of rows of holes are made capable of being drilled in the metal sheet or metal foil.

7. A metal sheet drilling device according to Claim 5 or 6, wherein the upper roll unit, lower roll unit and tensile force application means are provided in such positional relation that permits the metal sheet or metal foil to advance along a part of an outer circumference of the guide roll so that the metal sheet or metal foil is drilled as the metal sheet winds round the guide roll.

8. A metal sheet drilling device according to Claim 5 or 7, wherein the tensile force application means are formed of upper and lower pinch rolls adapted to hold the metal sheet or metal foil therebetween.

9. A metal sheet drilling device according to Claim 5 or 7, wherein the tensile force application means comprises a pair of upper and lower bridle rolls.

A2

10. A metal sheet drilling method for drilling a metal sheet or metal foil by using the metal sheet drilling device defined in one of Claims 5 to 9, wherein:

the metal sheet or metal foil is passed through the two tensile force application units provided on the front and rear sides of the drilling unit, the upper and lower roll units which constitute the drilling unit being rotated as a tensile force is applied to the metal sheet or metal foil by the tensile force application means each of which constitutes the tensile force application unit respectively, the metal sheet or metal foil being thereby drilled continuously.

11. A drilled metal sheet produced by using the metal sheet drilling device defined in one of Claims 5 to 9, and the metal sheet drilling method defined in Claim 10.

Add A3